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The Effect of Clearcutting on Air and Soil Temperatures in Southeast Alaska

Plant physiological processes and decomposition of unincorporated surface-soil organic layers often appear to proceed slowly at the comparatively low air and soil temperatures encountered in Southeast Alaska.^{1/} Considering that growing season temperatures under forest stands in this cool, humid region are not much higher than the generally accepted plant-zero range of about 40° to 42° F., a small temperature rise as a result of clearcutting may be sufficient to accelerate these processes and result in beneficial changes; providing other factors are not also limiting. Soil moisture is not a critical factor which inhibits growth in this region except for germination and survival of seedlings in thick, dense surface moss layers.^{2/}

Continuous air and soil temperature records in clearcut and undisturbed timbered areas, obtained during the summers of 1952, 1953, and part of 1954, show that appreciable temperature differences occur as a result of clearcutting.

Air temperature records at 3 feet above the soil surface, and soil temperature at 3 inches below the soil surface, were obtained in an open and a woods station using continuous recording thermometers. The location of both the open and the woods stations was changed each year. A summary of mean monthly temperatures at these stations is presented in Table 1.

These data show that maximum temperatures were consistently higher in the open. The mean monthly difference between open and timbered stations for summer air maxima ranged from 1.9° to 8.6° F.; and for soil maxima, from 3.4° to 13.4° F. The largest daily difference recorded for air maxima was 18° and for soil maxima, 24° F.; both of which occurred on the same day when air in the open reached 90°.

Air minima differences between the open and woods stations were negligible at the lower temperature ranges. The difference increased as air minima increased. Mean air minima were higher in the woods stations than in the clearcut stations during 1953 and 1954. The reverse prevailed in 1952, presumably due to the modifying effect of a salt water body near the open plot.

Soils in the open warmed and cooled earlier and more rapidly in the season than woods soils and displayed an average monthly increase in daily range of from 1½° to 8½°.

The largest temperature differences between the open and woods as a result of clearcutting were in soil temperatures. Next in order of magnitude were air maxima. Air and soil minima were least affected.

These findings are partial results of an over-all study of the relation of site factors to growth of Southeast Alaska tree species designed to reveal the critical silvical and ecological factors which should receive more intensive study.

^{1/} Observations made near Hollis on Prince of Wales Island.

^{2/} Godman, R.M. 1953. Moss retards regeneration in Southeast Alaska. Al. For. Res. Center Tech. Note No. 18.

Table 1.—Mean monthly air and soil temperature (°F) from continuous recording thermometers.

	<u>Max.</u>		<u>Min.</u>		<u>Mean</u>		<u>Av. daily range</u>		<u>Number of observations</u>
	Air	Soil	Air	Soil	Air	Soil	Air	Soil	
Open, 1952									
June	58.2	55.9	47.3	51.1	52.8	53.5	11	5	28
July	66.2	62.3	51.8	55.7	59.0	59.0	14½	6½	30
Aug.	67.0	63.8	53.9	57.5	60.4	60.6	13	6½	31
Sept.	57.0	54.7	50.2	51.2	53.6	53.0	7	3½	9/1-9/29
Woods, 1952									
June	55.0	47.1	46.6	44.5	50.8	45.8	8½	2½	28
July	62.3	53.6	51.7	50.6	57.0	52.1	10½	3	30
Aug.	63.1	56.0	53.6	53.0	58.4	54.5	9	3	31
Sept.	55.1	51.3	49.6	49.4	52.4	50.4	5½	2	9/1-9/29
Open, 1953 ^{1/}									
June	66.4	62.0	42.5	51.3	54.4	56.6	24	11	21
July	70.0	64.8	48.8	55.4	59.4	60.1	21	9½	31
Aug.	65.4	61.7	47.5	53.3	56.4	57.5	18	8½	31
Sept.	59.5	56.7	44.1	49.2	51.8	53.0	15½	7½	18
Woods, 1953									
June	58.5	48.6	46.8	47.1	52.6	47.8	12	1½	21
July	61.4	52.2	50.2	50.9	55.8	51.6	11	1½	31
Aug.	59.1	52.4	50.5	51.5	54.8	52.0	8½	1	31
Sept.	53.7	49.7	46.8	48.9	50.2	49.3	7	1	18
Open, 1954									
Aug.	73.6	67.0	51.8	56.1	62.7	61.6	22	11	8
Sept.	60.0	58.0	46.3	52.4	53.2	55.2	13½	5½	23
Woods, 1954									
Aug.	67.8	55.6	54.5	54.0	61.2	54.8	13½	1½	8
Sept.	55.7	49.7	47.9	48.7	51.8	49.2	8	1	23

^{1/} Air temperature observations made at 1 foot above ground surface.

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